Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B. TECH DEGREE EXAMINATION, JUNE 2017

Course Code**: CH 206**

Course Name**: FLUID AND PARTICLE MECHANICS II (CH)**

Max. Marks: 100 Marks Duration: 3 Hours

PART A

Answer any two full questions. Each question carries 15 marks.

1. a) Define drag. Briefly explain the forces acting on drag. (5)

   b) Differentiate between free settling and hindered settling. (5)

   c) Explain the flow patterns in fluidized bed. Discuss the advantages and disadvantages of fluidized bed. (5)

2. Derive the expression for pressure drop in a packed bed. Discuss the variation of Reynolds number in the pressure drop for the packed bed.

3. a) Oil droplets having a diameter of 20μm are to be settled from air at an air temperature of 37.8^0C at 101.3KPa. The density of the oil is 900kg/m^3. Calculate the terminal settling velocity of the droplet given air density 1.137 kg/m^3 at the specified conditions and viscosity of air is 1.9 x 10^{-5}Pa.s (7)

   b) Define fluidization. Obtain an expression to find minimum fluidization velocity in gas solid fluidized bed reactor. (8)

PART B

Answer any two full questions. Each question carries 15 marks.

4. a) Describe the classification of different types of pumps. Define NPSH and Cavitation. (8)

   b) It is desired to use 28.32 m^3/min of air (metered at a pressure of 101.3kPa and 294.1K) in a process. This amount of air, which is at rest enters the fan suction at a pressure of 741.7mmHg and a temperature of 366.3K and is discharged at a pressure of 769.6mmHg and a velocity of 45.7m/s. A centrifugal fan having a fan sufficiency of 60% is to be used. Calculate the break-KW power required. (7)

5. Explain about adiabatic frictional flow of compressible fluids and obtain the equations for energy balance and mass velocity for the same.

6. a) Air in an automobile tire is maintained at a pressure of 220kPa (gage) in an environment where the atmospheric pressure is 94kPa. The air in the tire is at the ambient temperature of 25^0C. A 4mm diameter leak develops in the tire as result of an accident. Approximating the flow as isentropic determine the initial mass flow rate of air through the leak. (10)

   b) Define stagnation temperature. Obtain an expression for stagnation temperature in isentropic flow regime. (5)

PART C

Answer any two full questions. Each question carries 20 marks.

7. a) Explain the flow patterns in agitated vessels. (10)

   b) Describe the different types of impellers used in process industries with proper sketches. (10

8. i) A flat blade turbine agitator with disk having six bladed is installed in a tank. the tank diameter is 1.83m, the turbine diameter is 0.61m, width is 0.122m and the height fluid is equal to the tank diameter. The tank contains four baffles, each having a width of 0.15m. The turbine is operated at 90rpm and the liquid in the tank has a viscosity of 10cp and a density of 929kg/m^3.

   a. Calculate the required power of the mixer
   b. for the same conditions, except for a solution having a viscosity of 100,000cp Calculate the required power. (15)

   ii) Write a note on standard turbine design (5)

9. Describe about the following:

   a. Ribbon blenders
   b. Muller Mixers
   c. Pug mills
   d. d. Masticators

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